



ALLEGHENY

STAINLESS STEELS FOR BUILDING

EXTERIOR WALLS

ENTRANCES · DOORS · WINDOWS

ROOFING · FLASHING · ROOF DRAINS



stainless steels in architecture



First three buildings of Pittsburgh's famous "Gateway Center," employing stainless steel curtain wall construction.

► types

Allegheny Stainless, Type 302: This is the basic "18-8" chromium-nickel grade. It can be formed and fabricated easily, and when used on exterior work, offers a high degree of resistance to atmospheric corrosion. Also to be seen on many interior jobs.

The physical and mechanical properties of Type 302 and the other grades listed here are set forth on page 3 in sufficient detail for general design purposes. The designations of the American Society for Testing Materials are sometimes made a part of architectural specifications. For plate, sheet and strip, ASTM specification A 167-44 Grade 2 is used for Type 302. The ASTM specification for bars is A 276-49 T, Type 302.

Allegheny Stainless, Type 301: A modification of the basic "18-8" analysis primarily designed for use where higher mechanical strength is required. Most widely used as CR strip in widths up to 23-15/16". Much used to make roof drainage products, offering great strength and light weight, long life and economy. Like Type 302 it has excellent resistance to corrosion from weather, and the two grades are frequently used interchangeably. ASTM designation: A 167-44, Grade 1.

Dating from its commercial inception in the late 1920's, architects were quick to see and utilize the structural possibilities of stainless steel.

Very strong and hard-surfaced, with a rich but neutral luster, stainless is a superior material for a host of important decorative and functional uses. The strength and beauty of stainless steel are lasting because they come not from any surface treatment, but from an alloy composition that resists rust and corrosion clear through. Further, stainless can be readily formed and fabricated, and it is easily cleaned—never requiring painting or repainting.

Allegheny Ludlum is proud to have been a pioneer manufacturer of a material which has been put to such beautiful and effective use. There are over 30 different chromium-nickel and straight chromium grades of Allegheny Stainless Steel. The types of special interest to architects are described below. Because of strategic reasons, the supply of some of these grades may be restricted from time to time, but thoroughly adequate alternate grades have been developed for practically every application.

Allegheny Stainless, Types 201 and 202: These types, containing manganese and less nickel are available for applications similar to those to which Types 301 and 302 are applied.

Allegheny Stainless, Type 316: Has extra corrosion resistance, specially indicated for marine uses, seacoast applications, etc. ASTM designation for Type 316 plate, sheet and strip is A 167-44 Grade 11; for bar, A 276-49 T, Type 316; for tubing, A 269-47 Grade TP 316.

Allegheny Stainless, Type 442: Excellent corrosion resistance, comparable in atmospheric exposure to 302, makes this grade the best straight chromium stainless steel for exterior work. Fabricates easily, but minor variation in fabrication techniques may be necessary as compared with the more commonly used 302.

Allegheny Stainless, Type 430: Corrosion resistance of this grade is not quite up to Type 442, but fabrication is similar. Type 430 is the principal straight chromium grade for interior work, and is also used for corrugated



► physical and mechanical properties

Stainless Type	301*	302*	316	442	430
Used for—	GENERAL PURPOSE	GENERAL PURPOSE	EXTRA CORROSION RESISTANCE	GENERAL PURPOSE	PRIMARILY INTERIORS, FORMED TRIM
Permanence	EXCELLENT	EXCELLENT	PREMIUM	EXCELLENT	VERY GOOD
Typical Properties (annealed)					
TENSILE STRENGTH, psi	100,000	80,000	75,000	80,000	60,000
Yield STRENGTH, psi	35,000	30,000	30,000	45,000	35,000
ROCKWELL HARDNESS (Max.)	B90	B90	B95	B95	B95
ELONGATION, per cent in 2"	50	50	40	20	20
MOD. OF ELASTICITY, psi	29×10^6	29×10^6	29×10^6	29×10^6	29×10^6
THERMAL EXPANSION COEF.	9.2×10^{-6}	9.2×10^{-6}	9.2×10^{-6}	5.6×10^{-6}	5.6×10^{-6}
Composition					
CHROMIUM, per cent	16 to 18	17 to 19	16 to 18	18 to 23	14 to 18
NICKEL, per cent	6 to 8	8 to 10	10 to 14	0.50 max.	0.50 max.
CARBON, per cent	0.15 max.	0.15 max.	0.1 max.	0.25 max.	0.12 max.
MOLYBDENUM, per cent	—	—	2 to 3	—	—

* See paragraph on preceding page regarding Types 201 and 202.

industrial roofing. During period of nickel scarcity, it has been used for roof drainage products and curtain wall panels. Type 442, however, offers better assurance against superficial staining. ASTM designation for Type 430 plate, sheet and strip is A 176-49, Grade 4; for bars, A 276-49 T, Type 430.

Allegheny Stainless, Types 303 and 430 F: Used in making many of the fasteners and other machined parts which should be specified for stainless construction. These types are the free-machining modifications of Types 302 and 430. Generally specified only as finished screws, bolts and nuts, etc.



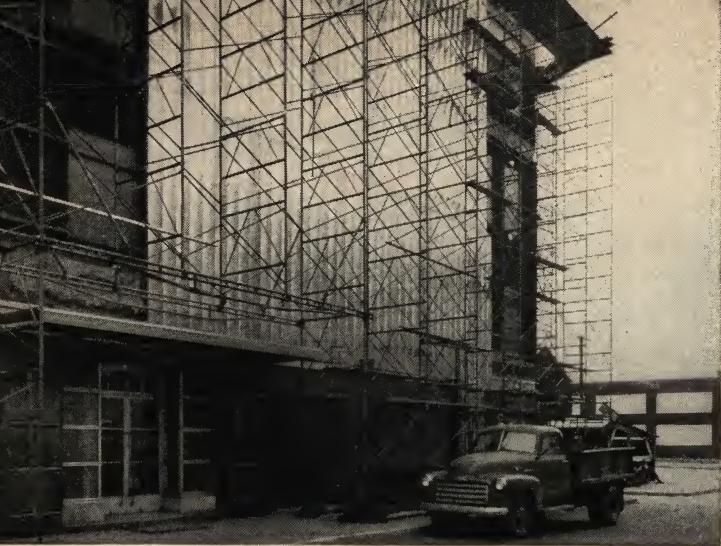
G.E. Office Building in Schenectady.
Stainless curtain wall construction.

► forms

By far the most widely used mill forms of Allegheny Stainless Steel in architecture are cold-rolled sheet and strip in relatively light gages, taking advantage of stainless steel's unique combination of strength and corrosion resistance. Brake-press, or roll-formed sheet and strip members are prominent in marquees, lobbies, store fronts and wall panels. Strip (under 24" wide) offers a price advantage in its size range over sheet, which is available

up to 72" wide.

As adjuncts to components and structures formed from sheet and strip, hot rolled and cold finished bars are available in a wide range of sizes and shapes. Welded and seamless tubing are likewise offered in sizes to meet ordinary design needs. Plates (over 3/16" thick) are also available, although designs generally avoid such heavy thicknesses.



Stainless curtain walls,
applied over existing structure.

► finishes

Allegheny Stainless Steel sheets are produced in 5 standard finishes applicable to architectural use:

No. 2D—Full-finished, and dull cold-rolled to give a non-reflective effect.

No. 2B—Full-finished, and bright cold-rolled. Somewhat brighter than 2D, but does not have the high luster of a polished finish. The most widely used finish for such purposes as exterior wall panels.

► fabrication



No. 4 —Polished. This is the most commonly used finish for installations which are close to the public eye, as in building lobbies, marquees, etc. It is bright, but not highly reflective, and finger-marks less than other finishes. It is not difficult to match in covering fabrication marks and blending welds.

No. 6 —Polished, and tampico brushed. This is a number 4 finish brushed with tampico fiber. The result is conservative, soft, with low reflectivity.

No. 7 —High luster polish, the highest normally furnished.

Cold rolled strip finishes are less standardized, and there is considerable difference between the appearance of the straight chromium and chromium-nickel grades. Finishes of varying degrees of brightness are available, as approved by the architect. Plates are offered in pickled or polished finishes.

In general, a similar or matching finish can be secured on other forms of stainless steel which may be used in a design, such as bars, tubing, castings or forgings. In the event that a polished or dull-finished smooth metal surface is not the effect you want, textured Allegheny Stainless Steel may offer a solution. This is stainless strip or sheet with an embossed, relief texture, with varying patterns produced by cold working between special rolls.

Outside of custom-designed and built building components, there are many standard stainless fabrications which architects can include in their designs, such as the following. All Allegheny Ludlum sales offices can help you locate good sources.

finished units: Curtain Wall Panels, for exteriors, and Doors, Windows, Door and Window-Frames, also Storm and Screen Doors. Kitchen Equipment—standard cabinets, counters, refrigerators, shelves, sinks, stoves, etc. Roof Drainage Equipment—gutters, downspouts, miters, caps, hangers, etc.

accessories: Hardware of all description. Letters and Numbers—for signs and marquees, etc. Screening—for insects, decorative use, or safety. Through Wall Flashing, Weatherstripping, etc.

construction materials: Roll Formed Sections—for panel framing, store-front and glass-holding components, etc. Perforated Stainless Steel—in many patterns, for grilles, etc. Panels—stainless bonded to plywood, honey-comb, etc. for interiors or exteriors. Textured Sheets and Strips—either plain or bonded, and Wall Tile—smooth or textured. Skylight and Sash Members. Expanded Stainless Steel—similar to metal lath, for grilles and screens—and Tie Wire. Wire Rope and Chain—practically all sizes, for decoration or utility. Anchors, for masonry or brick walls. Corrugated Stainless Roofing and Siding—for industrial construction purposes. Nails, Screws, Bolts and Nuts—fasteners of all descriptions.



► specifications

In handling stainless steel for architectural purposes, the specifications below are suggested as typical:

grade: Stainless steel shall be Allegheny Type ___, annealed, except where other types or tempers are specified.

finished samples: Finish shall conform to standard mill finish, as specified on drawing, except where a special finish is indicated. All non-standard finishes are to be submitted by fabricator for approval.

shop drawings: Shop drawings shall be submitted which will show in detail all work to be supplied. Drawings (full scale unless impractical) shall show thicknesses of metal, construction details, methods of joining, reinforcing, anchoring and supports. Drawings shall show methods for applying all screws and other fastenings. Finishes shall also be specified on the drawings if these are to be applied.

workmanship: Workmanship shall be in character with the high quality of the material being fabricated and installed. Welds shall be free from imperfections, and shall be finished and blended as closely as practicable to the parent metal. Joints shall be tight, and visible fasteners shall be blended as closely as practicable to the adjoining metal. All surfaces of stainless shall be kept clean and free from contamination by ordinary steel or iron.

fasteners: All fasteners shall be stainless steel of the correct grade, as recommended by the manufacturers of the fasteners.

fabrication: Wherever possible, all parts shall be formed, cut, drilled, tapped, welded, fitted or otherwise fabricated in the shop.

welding: In arc and gas welding, electrodes or filler rods shall be the correct type, as recommended by the electrode manufacturers. This also applies when stainless and carbon steels are joined. All welds shall be sound, and free from defects. Flux and welding oxides, and the discoloration

they produce, must be removed by pickling or grinding since such oxides rust rapidly. Exposed weld beads shall be ground or polished to conform with adjacent areas.

soldering: Soldering shall be used only for filling or sealing joints (lockseamed, spot welded, riveted, etc.) and must not be depended upon for mechanical strength. The area to be soldered shall be cleaned and etched with a suitable flux, and the flux shall be restricted to this area. The soldering operation shall follow immediately. The minimum tin content of the solder shall be as specified, and the remainder shall be lead. Where holding tarnishing of the solder to a minimum is desirable, a solder of 75% tin and 25% lead is recommended; otherwise, 50% tin solder is usually adequate. Immediately after soldering, the surface shall be washed with a solution of washing soda, or other neutralizer, followed by a clear water rinse.

protection of less corrosion-resistant metals: Less corrosion-resistant materials shall be protected, as far as possible, from action of the elements. Joints between stainless steel and other metals shall be protected from the weather wherever practicable. Carbon steel shall be protected by at least two shop coats of approved bituminous paints. Painted parts should be thoroughly dry before assembling.

protection of the stainless steel surface: The use of paper, adhesive paper, or plastic film coating is recommended during fabrication, transportation and erection to protect against marring, stray paint, plaster, salts, acids, and staining from accidental contact with, or drip from, rusted carbon steel or other dirt. The protective coating shall be applied and removed in strict accordance with the instructions of the adhesive manufacturer.

cleaning: Upon instruction, the protective coating shall be removed and, if necessary, the exposed surfaces of the stainless steel shall be washed with water and detergent, or other safe cleaning agents. (Note: Allegheny Ludlum welcomes consultation on cleaning procedures.)



Stainless steel entrance, with stainless steel soffit, fascia and railings.



Windows on new 160,000-kw power plant, which employed stainless steel curtain wall construction, have more than 14,000 square feet of sash framed and trimmed with stainless steel.



Stainless steel roofing sheets, here fastened to the roof beams by means of studs, spaced at every third corrugation. Top of each stud was hit with hammer.

► advantages

The advantages of stainless steel are readily apparent. For one thing, it is beautiful and it blends harmoniously with other materials. For certain decorative and functional purposes, no other material is more suitable. Also, it is well-nigh everlasting in service, even in industrial atmospheres containing large amounts of smoke, furnace fumes, mill dirt, etc.

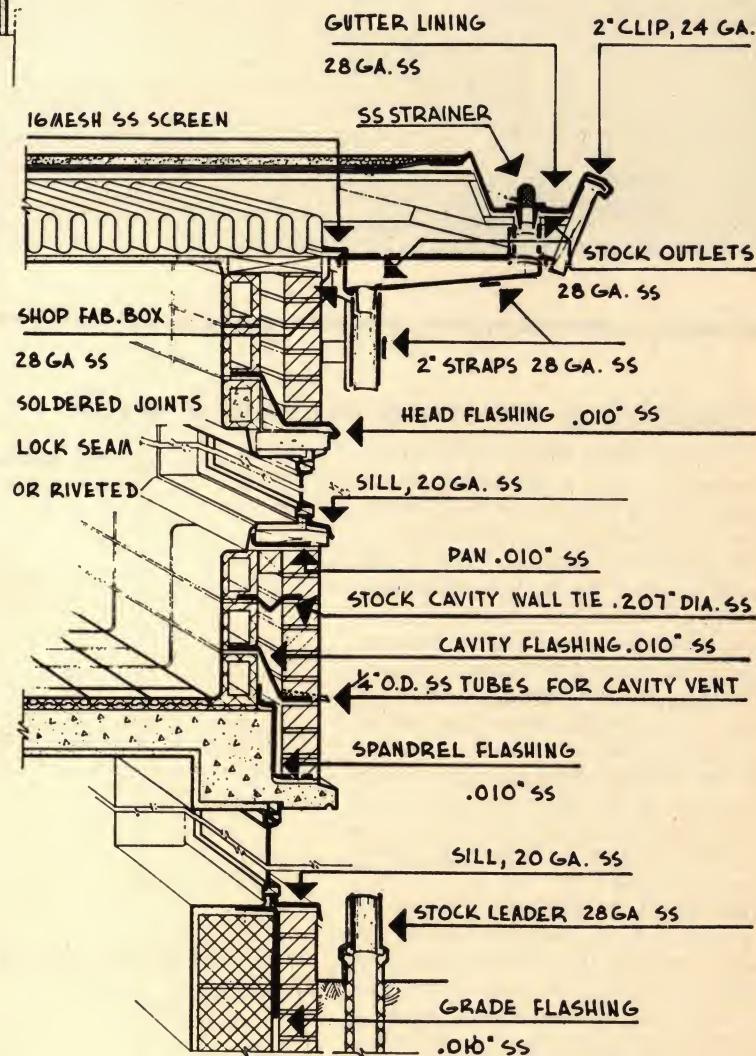
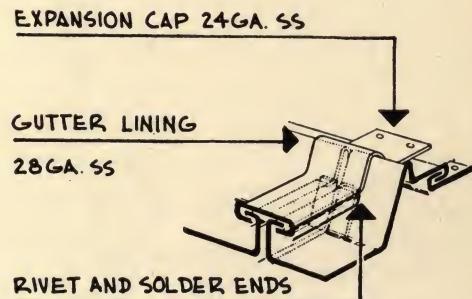
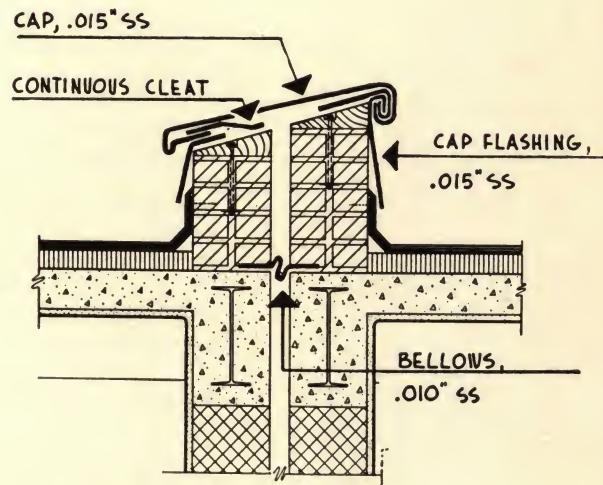
Its resistance to corrosion is outstanding. This fact, plus the fact that stainless is so easy to clean and keep clean, never requiring painting or repainting, make it a highly economical material—probably the least expensive of all in the long run.

long life: The lasting qualities of Allegheny Stainless have been rigorously tested in the oil refining, chemical, dairy, textile, meat-packing, canning and other industries. They have subjected stainless steel equipment to corrosive and mechanical abuse far more destructive than that normally exerted by the forces of nature, or by the gases and smoke around mill buildings, power stations, etc. These industries have checked the performance of stainless steel and the other metals architects use, and they have found stainless by far the most enduring.

harmonious blending: Allegheny Stainless Steel does more than add its own beauty to a design—it brings out the beauty of other materials. Its quiet luster points up the intrinsic color values of other surfaces, such as stone, wood, porcelain enamel or paint. It blends perfectly with glass, or glass brick, suggesting the same clean quality. In spandrels, mullions, or curtain walls, stainless brings out the grace and lines of good construction.

lasting corrosion resistance: Stainless steel does not deteriorate with age and exposure, as do most other metals, because stainless has large amounts of chromium in it—alloyed in the melt with the iron. It does not rust like ordinary iron and steel because adherent oxides of chromium form spontaneously on exposed surfaces to establish an invisible armor the instant the metal is exposed to the air.

economical: Stainless is easy to clean. This fact does more than help insure a good appearance—it means cash-in-hand savings for those who pay for maintenance. Reduction of cleaning labor and materials, which have become increasingly more expensive, is a very real economy.



Above: this stainless steel roof for a residence is made of 28-gage stainless steel strip, employing conventional standing-seam construction. Architect: August Perez, New Orleans.

Allegheny Stainless Steel for weather-protection uses is definitely comparable in economy with other high-quality systems, and offers many advantages: appearance, strength, freedom from staining or bleeding, indefinitely long life, higher hardness and consequent better resistance to erosion.

At right: details of typical stainless steel roof and drainage construction, showing methods of handling stainless cap, gutter lining, sill, pan, flashing at various points, etc.



► exterior walls

The use of stainless steel for exterior walls of steel-frame buildings is receiving considerable attention in the architectural and construction industry. A wide latitude of choice is available, ranging from corrugated sheeting, through various forms of non-structural facing, to modern curtain wall panels of standard or highly individualistic design.

The notes on shapes and textures, at right, and on typical wall systems on the following two pages, typify the great variety that is possible with this type of construction. Utilization of light, thin walls—in which metals are combined with modern insulating materials as a replacement for traditional masonry—is a sound and logical idea. The advantages are obvious. Among them are: savings in weight, space, erection time, and maintenance; also definite gains in appearance, insulation, all-weather construction, fire safeness, water tightness, and durability.

► sheathing existing masonry walls

Stainless steel can be used for appearance and weather resistance, along with a back-up of low-cost masonry of permissible code thickness.

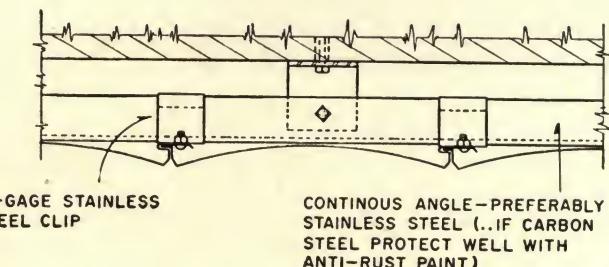
wood-furring method: This is suitable for store fronts, low commercial buildings, office and apartment buildings. Stainless steel facing may be nailed or screwed to the wood furring. This type of construction is particularly applicable to the renovation of existing structures.

metal-anchor method: This should be used in the better class of steel buildings to insure permanence. Where corrosion is a factor, stainless anchors are the answer.

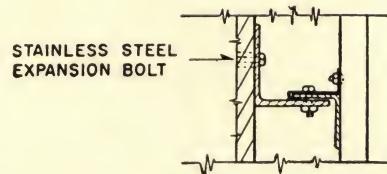
concrete-wall method: Where the upgrading of a concrete wall is desired, stainless steel can be placed inside the wood forms and will provide a permanent, weather-proof finish.

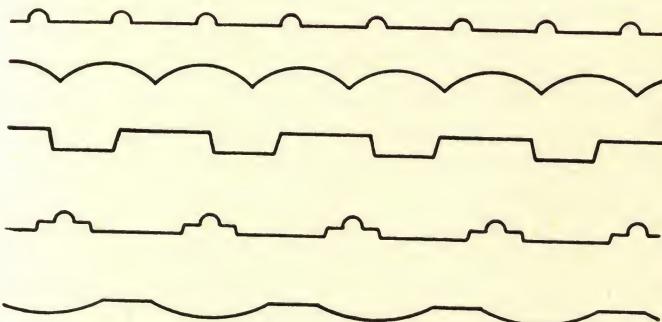
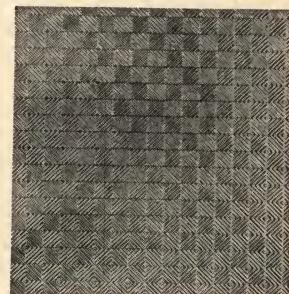
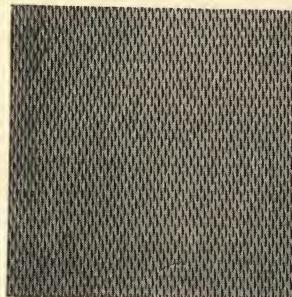
corrugated sheeting: For upgrading mill buildings, etc., to secure long life with little maintenance, corrugated stainless sheeting is used for both siding and roofing, fastened directly to the supporting members like ordinary galvanized sheeting, with studs or stainless fasteners.

horizontal cross-section:



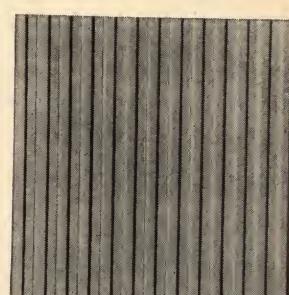
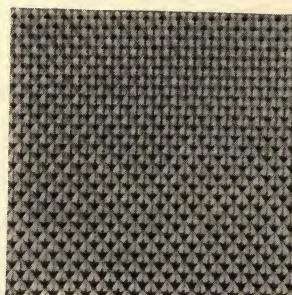
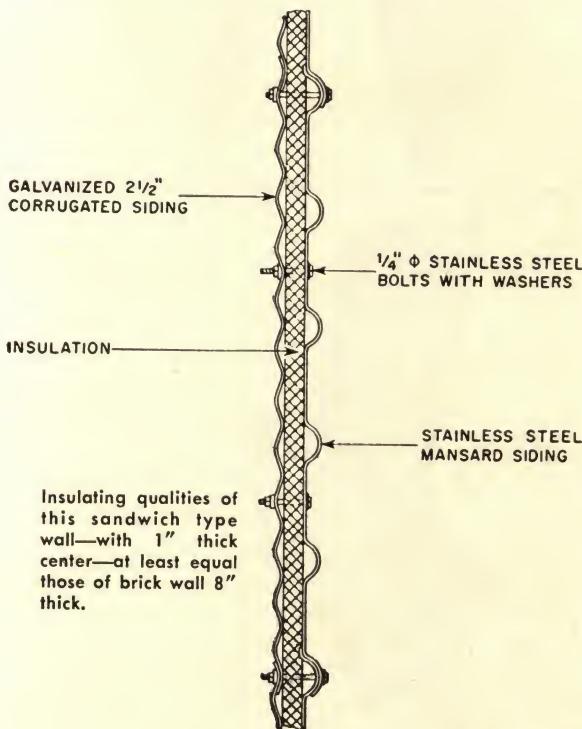
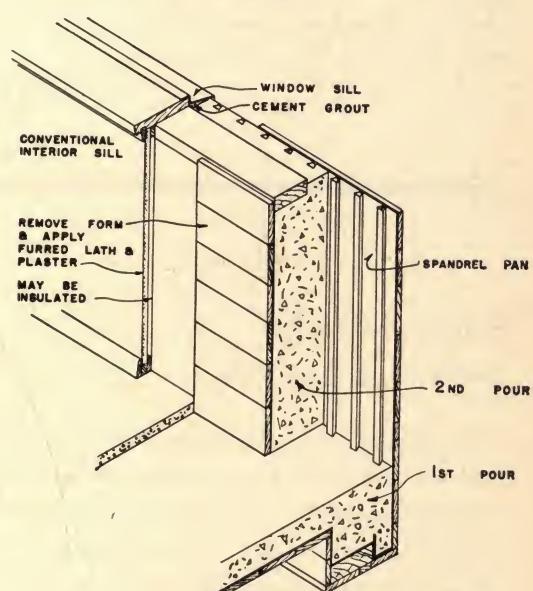
vertical cross-section:



shapes**textures**

▲ **ROLL OR BRAKE FORMED PANELS**—either side of such forms as shown above may be used. Fluted panels of almost any design may be used. If the job is of sufficient size to warrant making special dies, specially designed stamped panels may be used.

► **TEXTURED PANELS**—textural treatments can be used so long as they do not interfere with forming the stainless panels. They add variety in appearance and offer advantages in masking scratches or handling marks.

**sandwich siding construction:****poured concrete wall with stainless sheathing:**

view at floor ▲

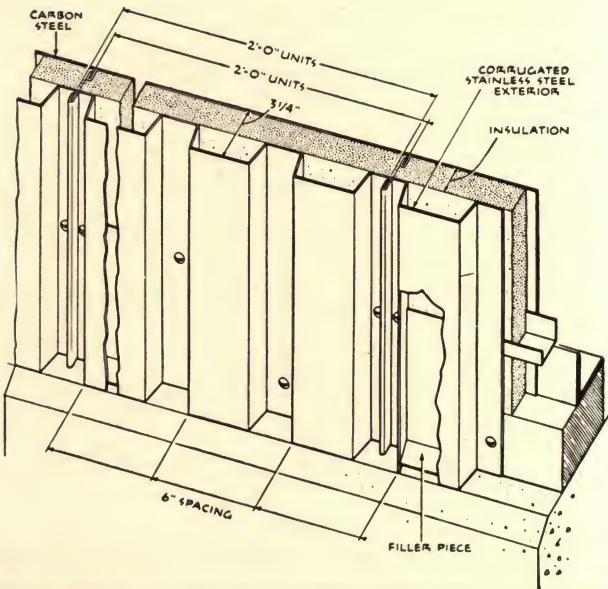
► prefabricated panel

with integral non-rigid insulation

These stainless steel face panels are designed to take the wind load independently—a duty in which the high strength and high elastic modulus of stainless are of considerable assistance.

The back-up is assumed to furnish all of the required fire resistance although the face, in fact, furnishes added fire resistance to the wall. The face sheet can be used either as shown at right (with a back-up of factory or field-applied insulation plus an interior liner sheet) or as shown on the facing page, with masonry. Where code requires an interior masonry wall, the insulation and liner sheet may be omitted.

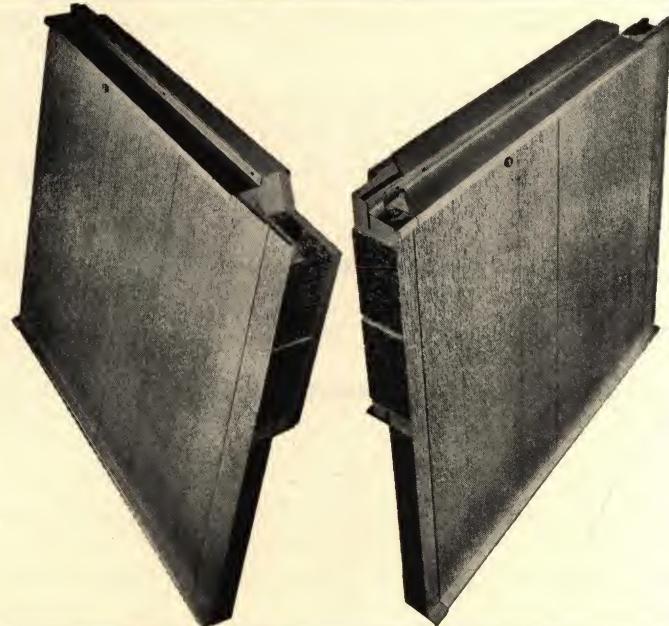
This type of construction is widely used for plant office buildings, power houses and similar structures.



reinforcing-type stainless steel facing

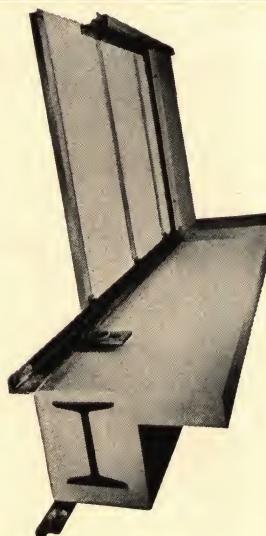
The spandrel-type unit shown on the facing page is intended primarily for use between building piers. The assembled panels, if desired, may incorporate windows with span from floor to floor.

The back-up may be that required for a traditional masonry wall, or, if the codes have been modernized, the stainless steel spandrel may be backed with less than the normal masonry thickness or with other materials. The illustration at the right shows two cutaway views of the construction of a typical panel, which consists of textured stainless steel pans, cast insulation, and inner wall. For pictorial clarity, a model was used.

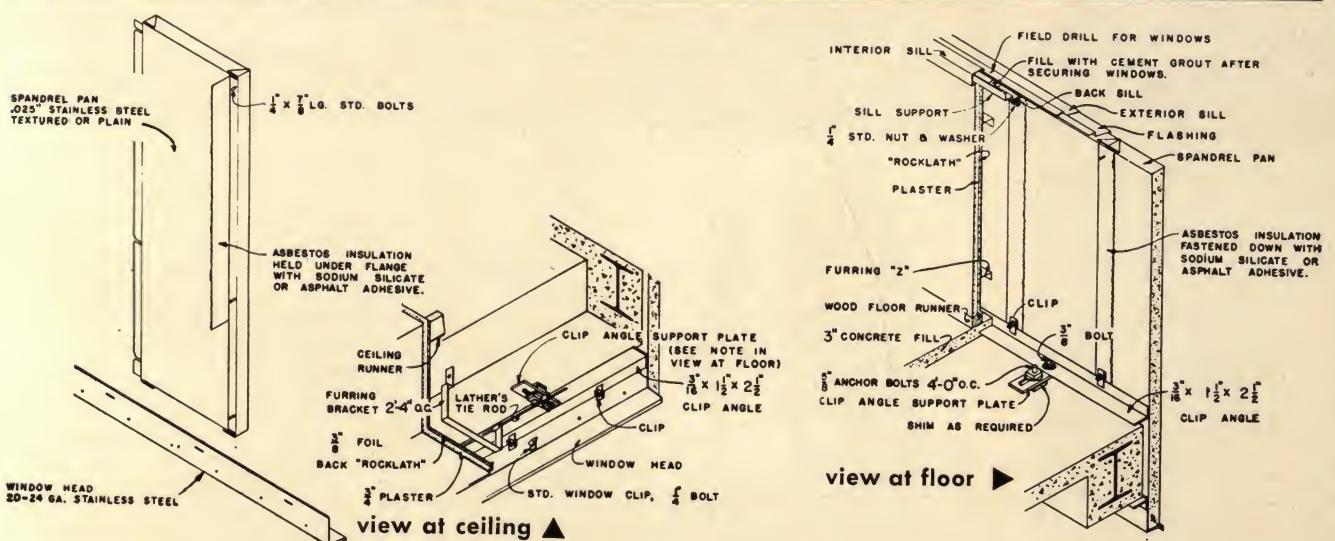
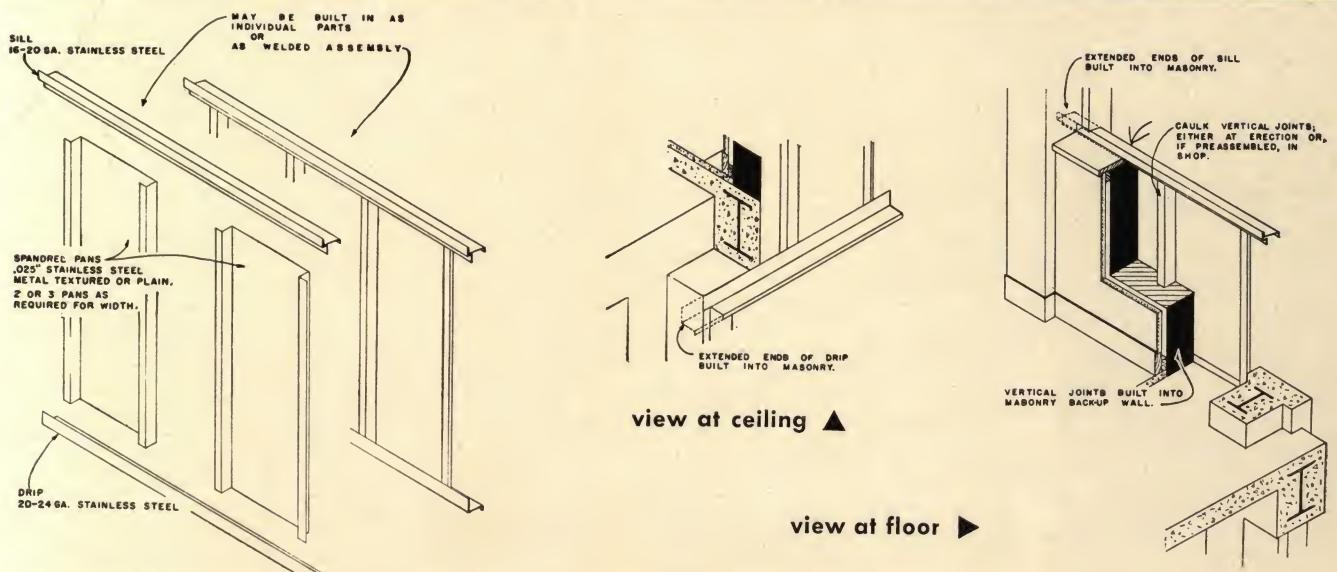
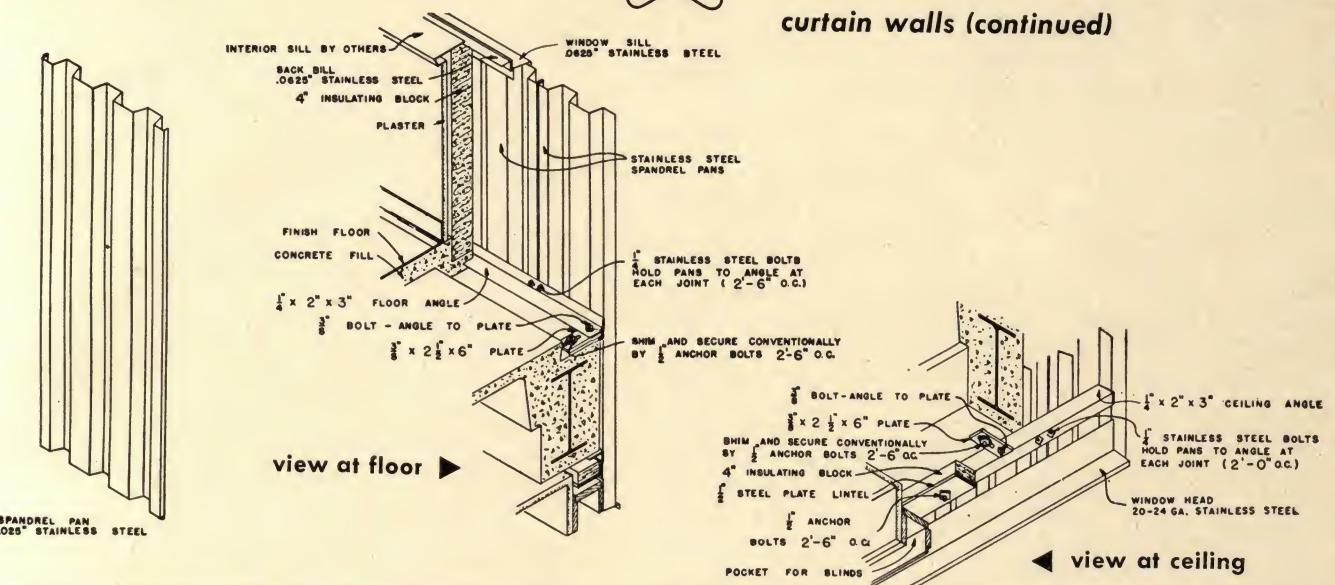


panel wall with rigid type insulation

A rigid type insulation, combined with a metal-pan design and used with interior plaster finish, indicates economies in construction and should give fire-resistant ratings of from two to four hours—depending on the thickness of plaster, method of attaching furring, and protection used back of pans at joints. Meets wind test also.



At Left: back view of partially assembled model. Note the simulated plastic wall and ceiling.

curtain walls (continued)




ALLEGHENY LUDLUM ORGANIZATION

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division

Carmet Division Detroit 20, Michigan	Forging and Casting Division Detroit 20, Michigan
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subsidiaries

The Wallingford Steel Co. Wallingford, Connecticut	The Arnold Engineering Co. Marengo, Illinois
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Stainless steel-sheathed Socony Mobil Building at Lexington Avenue and 42nd Street, New York City.

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